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In re Breedis, et al.
Reply Brief
IN TRIPLICATE

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES #13

Appellant(s):	John F. Breedis, Ronald N. Caron, Carl L. Deppisch	Docket No.:	101931-100
Serial No.:	09/192766	Examiner:	S. Ip
Filed:	November 16, 1998	Art Unit:	1742
ASSIGNEE:	Olin Corporation		
For:	STRESS RELAXATION RESISTANT BRASS		

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Date: August 28, 2001 Person Mailing Paper: Jody Lynn DeStefanis

APPELLANTS' REPLY BRIEF UNDER 37 CFR 1.193(b)

Assistant Commissioner for Patents
US Patent and Trademark Office
Washington, DC 20231

Dear Sir:

In reference to the above-identified Patent Application, this is a Reply Brief in response to the Examiner's Answer (Paper No. 12) mailed June 29, 2001, setting a period for filing this Appellants' Reply Brief on or before August 29, 2001. The Primary Examiner is hereby respectfully requested to reopen prosecution to respond to this Reply Brief. More specifically, the Primary Examiner is respectfully requested to withdraw the rejections in light of the arguments set forth below and to allow a patent to issue on the claims as currently pending.

1. Summary of Invention

As disclosed at page 1, lines 13-27 of the specification of the subject patent application, alpha brasses are single phase alloys of copper and zinc that contain up to 39% of zinc. These alloys generally have good formability, moderate strength, modest

electrical conductivity and low cost. These characteristics make these alloys suitable for use in appliance and automotive applications. However, alpha brass alloys typically have inadequate resistance to stress relaxation when exposed to elevated operating temperatures, and are not suitable for use in environments having operating temperatures significantly above room temperature. By contrast, alloys such as C510 and C425 retain adequate stress relaxation at elevated temperatures, but do not have electrical conductivity sufficient for appliance and automotive applications.

Appellants' invention, as embodied in claim 1 and the claims dependent therefrom, is a brass alloy having improved resistance to stress relaxation as compared to conventional alpha brass alloys. This improved brass alloy consists essentially of an alpha brass base (see page 6, line 148) with the addition of controlled amounts of nickel, tin and phosphorous (see page 4, lines 106-107). As embodied in claim 1, the disclosed brass alloy consists essentially of (by weight): 5% to 25% zinc (see page 13, line 304), 0.3% to 2% nickel (see page 6, lines 163-169), 0.15% to 1% tin (see page 8, lines 213-217), 0.03% to 0.35% phosphorous (see page 7, lines 185-189) and less than 0.1% each of silicon and beryllium (see page 14, line 349 to page 15, line 355). Preferably, the weight ratio of Ni:P should be between 3.5:1 and 7.5:1 (see page 8, lines 192-195). The Appellants have discovered surprisingly that an alloy meeting this compositional configuration will exhibit improved resistance to stress relaxation while retaining adequate electrical conductivity.

2. Arguments

A. The present patent application provides factual evidence, commensurate with the scope of the claims, demonstrating unexpected properties.

A prima facie case of obviousness may be rebutted by a showing of unexpected results, i.e., a showing that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected. In re Geisler, 116 F.3d 1465, 1469 (Fed. Cir. 1997); In re Soni, 54 F.3d 746, 750 (Fed. Cir. 1995). This principle asserts that an invention that yields results that would have been surprising to a person of ordinary skill in a particular art is not obvious. In re Soni, 54 F.3d at 750.

Unexpected results must be established by factual evidence; mere argument or conclusory statements in the specification is not sufficient. In re Geisler, 116 F.3d at 1470. The examiner must consider data in the specification comparing the invention to the prior art (or controls) when determining whether the claimed invention provides

unexpected results. In re Soni, 54 F.3d at 750. Furthermore, all evidence of the unexpected properties of the claimed invention must be considered as a whole in light with the prior art. In re Dillon, 919 F.2d 688, 694 (Fed. Cir. 1990), cert. denied, 500 US 904 (1991); see also, Ex Parte Anderson, 1991 Pat. App. Lexis 12, 21 U.S.P.Q.2d (BNA) 1241 (1991). In order to be convincing, the objective evidence proffered must be commensurate in scope with the claims to which the evidence is offered to support. In re Tiffin, 448 F.2d 791, 792 (Fed. Cir. 1971); In re Greenfield, 571 F.2d 1185, 1189 (Fed. Cir. 1978).

The Appellants disclose numerous examples of the present invention in which unexpectedly superior characteristics are exhibited. As described at page 18, lines 447-450, inventive alloy "A" has a Ni:P ratio of 5:1, within the claimed scope of 3.5:1 to 7.5:1. After processing, this alloy had a yield strength of 70 ksi, a tensile strength of 74 ksi, and an electrical conductivity equal to 36% IACS (see page 18, lines 461-464). This alloy retained 87% of its stress after 3000 hours at 125° C and 73% of its stress after 3000 hours at 150° C (see Table 3 at page 12). Similarly, inventive alloy "B", as described at page 19, lines 477-479, has a Ni:P ratio of 5:1, within the claimed scope of 3.5:1 to 7.5:1. After processing, this alloy had a yield strength of 70 ksi, a tensile strength equal to 78 ksi, and an electrical conductivity equal to 28% IACS. This alloy retained 84% of its stress after 3000 hours at 125° C and 62% of its stress after 3000 hours at 150° C (see Table 3 at page 12).

These alloys' characteristics are superior to the alloys of the prior art. More particularly, these alloys have acceptable or better than expected conductivity and strength while displaying markedly improved resistance to stress relaxation as compared to conventional alloys. Alloys C260, C425, and C510 are typically used in appliance and automotive applications as they exhibit adequate strength and conductivity. However, the uses of these alloys are limited by their poor resistance to stress relaxation. These alloys have a yield strength between 68 and 85 ksi, and electrical conductivity between 15% and 28%. Alloys C260, C425 and C510 retain between 48 and 79% stress after 3000 hours at 125° C (see Table 3 at page 12). By contrast, as described above, alloys of the present invention have between 84 and 87% stress remaining after 3000 hours at 125°C (see Table 3 at page 12). Accordingly, alloys made in accordance with the present invention exhibit up to 81% more stress remaining under comparable conditions, while retaining adequate electrical conductivity.

After 3000 hours at 150°C, alloys C425 and C510 retain between 48 and 54% stress (see Table 3 at page 12). By contrast, alloys of the present invention have between 62 and 73% stress remaining under the same conditions (see Table 3 at page 12). Accordingly,

alloys made in accordance with the present invention exhibit up to 52% more stress remaining under comparable conditions, while retaining adequate electrical conductivity.

B. Appellants' claims are patentable over the cited prior art as the claimed range exhibits unexpected properties not disclosed in JP 05311292.

In his Answer, the Examiner asserts that JP 05311292 (JP '292) bars issuance of the present invention on the grounds that:

1. Samples No. 13 and 14 of JP '292 show that the "claimed Ni/P ratio is not critical and does not provide unexpected properties by itself" and

2. "[T]he claimed intended use of the claimed alloy does not lend patentability to the alloy."

Accordingly, the Examiner asserts that "[a] mere statement of a new use for an otherwise old or obvious composition cannot render a claim to the composition patentable."

It is well established that small changes in percentages of the ingredients often produce alloys of totally different characteristics. Aluminum Co. of America v. Thompson Products, Inc., 122 F.2d 796, 799 (6th Cir. 1941) (internal quotations omitted). Such small changes in percentages of ingredients show improved performance in a "critical" range. These critical ranges are patentable even though they may fall within a range disclosed in the prior art. In re Geisler, 116 F.3d at 1469-70; In re Woodruff, 919 F.2d 1575, 1578 (Fed. Cir. 1990). Criticality is supported upon a showing that the claimed range achieves unexpected results relative to the prior art range. Id. A demonstration of substantially improved unexpected results is sufficient to establish criticality of the claimed range, in the absence of contrary evidence." In re Soni, 54 F.3d at 751; Oscar Mayer Foods Corp. v. Conagra, Inc., 869 F.Supp. 656, 661 (W. D. Wis. 1994), aff'd, 45 F.3d 443 (Fed.Cir. 1994), cert. denied, 516 U.S. 812 (1995).

JP '292 is drawn to a brass alloy having utility as a component for a heat exchanger having a composition, by weight, of 8-20% zinc, 0.3-1.5% nickel, 0.3-1.2% tin, 0.005%-0.20% phosphorous with the balance being copper. The ratio of Ni:P is disclosed as ranging from 5:1 to 50:1. Table 1 of JP '292 discloses alloys 13 and 14, having a composition of 17.55% zinc, 0.27% nickel, 0.20% tin, 0.05% phosporous and the balance copper (Ni:P ratio equal to 5.4:1) and 15.8% zinc, 0.37% nickel, 0.40% tin, and 0.05% phosphorous, and the balance copper (Ni:P ratio equal to 7.4), respectively. Paragraphs [0039] and [0040] disclose that both of these alloys have inferior strength and stress related corrosion and cracking resistance.

[0039]

> ... In addition, Sample No. 13, which contained the amount of Zn specified in the present [e.g., JP '292] invention, but contained less Ni and Sn than specified by the present [e.g., JP '292] invention, had inferior strength and stress-related corrosion and cracking resistance.
>
> [0040]
> On the other hand, Sample No. 14, which contained the amounts of Zn, Ni, Sn and P specified by the present [e.g., JP '292] invention, but contained less than the amount of Ni+Sn specified by the present [e.g., JP '292] invention clearly had inferior strength and stress-related corrosion and cracking resistance.

Accordingly, JP '292 discloses that the alloy samples having a Ni:P ratio equal to 5.4:1 and 7.4:1 have **inferior** characteristics. Further, such inferiority appears to be attributed to the Ni and Sn content rather than the Ni and P content.

By contrast, Appellants have discovered that a preferred Ni:P ratio of 5:1 is critical and produces enhanced and unexpected characteristics. More specifically, at Table 3, inventive alloys A and B (having Ni:P ratios equal to 5:1 and 4.6:1, respectively) exhibit 87% and 84% stress remaining after 3000 hours heating at 125°C. These analytical results are significant and demonstrate that a critical Ni:P ratio exists at approximately 5:1, a finding that is unexpected in light of the JP '292 disclosure. Because JP '292 teaches away from the Appellants' claimed ranges by suggesting that the claimed 3.5:1 to 7.5:1 ratio are not critical, Appellants' alloys are inventive and allowable over JP '292.

While the Examiner correctly states that "[a] mere statement of a new use for an otherwise old or obvious composition cannot render a claim to the composition patentable," Appellants assert that alloys with unexpected characteristics have been identified, not merely that a new use has been discovered. It is well established that the discovery of an expected property in the claimed compounds, as compared to the prior art, is sufficient to overcome a showing of obviousness. In re Hoch, 428 F.2d 1341, 1344 (CCPA 1970); In re Ruschig, 343 F.2d 965, 978 (CCPA 1965). Appellants have discovered that this new characteristic allows this alloy to be effectively used as an electrical connector. There is nothing in JP '292 reference to teach or suggest the applicability of the reference alloys for use as an electrical connector, particularly because these characteristics were not identified (or expected) from the analytical results of the JP '292 inventors. Accordingly, Appellants' discovery of new and useful properties supports its contention that the claims as drafted are allowable over JP '292.

C. Appellants' claims are patentable over JP 4-354843, JP 6-184679, JP 7-126779, JP 5-311294, JP 5-311295, JP 4-231430, JP 6-179932, and JP 6-228684 under the Antonie exception.

In his Answer, the Examiner asserts that JP 4-354843 (JP '843), JP 6-184679 (JP '679), JP 7-126779 (JP '779), JP 5-311294 (JP '294), JP 5-311295 (JP '295), JP 4-231430 (JP '430), JP 6-179932 (JP '932), and JP 6-228684 (JP '684) bar issuance of the present invention on the grounds that:

1. These references disclose ranges that overlap the claimed range and that "selecting a range in a known range by optimization for the best results is within the ambit of ordinary skilled artisan" and

2. When read in combination with JP '292, "the claimed Ni/P has no unexpected results."

In re Boesch, 617 F.2d 272 (CCPA 1980) stands generally for the proposition that "selecting a range in a known range by optimization for the best results is within the ambit of ordinary skilled artisan;" however, under In re Antonie, 559 F.2d 618 (CCPA 1977), a motivation to identify an optimized range must be present in the prior art. More specifically, the Antonie court concluded that while the "discovery of an optimum value of a variable in a known process is normally obvious," an exception exists in cases "in which the parameter optimized was not recognized to be a result-effective variable." Id. at 620.

The references cited by the Examiner either disclose a Ni:P ratio well above that claimed by the Appellants, disclose an extremely broad range, or suggest that the Appellants' range is ineffective. In all three situations, the disclosures imply that the Ni:P ratio is not a result-effective variable. Accordingly, all of the references cited by the Examiner fall within the Antonie exception and would not lead a skilled artisan to a Ni:P ratio of between 3.5:1 and 7.5:1.

More specifically, JP '843, JP '294, and JP '295 disclose alloys have Ni:P ratios well above the claimed 3.5:1 to 7.5:1 range (see below). Further, none of these references suggest that improved characteristics may be achieved by reducing the Ni:P ratios to below 7.5:1. Accordingly, these references fall under the Antonie exception.

Reference	Disclosed Ni:P Ratio
JP '843	From 10:1 to 29.33:1
JP '294	15.0:1
JP '295	19.2:1

JP '843 discloses a copper base alloy containing 7-18% zinc, 0.5-3.0% nickel, 0.5-2.0% tin and 0.01-0.20% phosphorous. There is no recognition of the significance of the Ni:P ratio apparent from the translated abstract and the table at page 4 of JP '843. However, with reference to that table, the exemplary alloys have a Ni:P ratio of between 10:1 (alloy number 11) and 29.33:1 (alloy number 3). Accordingly, there is nothing in JP '843 to teach or suggest that for electrical connector applications, a maximum Ni:P ratio of 7.5:1 provides enhanced properties. Because this reference discloses a minimum ratio of Ni:P equal to 10:1, optimization of a this alloy would not lead an ordinary skill artisan to reduce the Ni:P ratio below 10:1.

Likewise, JP '294 discloses a copper alloy suitable for use as a heat exchanger and having a Ni:P ratio maintained at 15.0:1. There is nothing in JP '294 to teach or suggest the Ni:P ratio should be reduced. Accordingly, an artisan would not be compelled to further experiment with the ratio to create a copper alloy exceptionally suitable for use as an electrical connector.

Finally, JP '295 discloses a copper alloy suitable for use as a heat exchanger having a Ni:P ratio maintained at about 19.2:1. There is nothing in JP '295 to teach or suggest the Ni:P ratio should be reduced. Accordingly, an artisan would not be compelled to further experiment with the ratio to create a copper alloy exceptionally suitable for use as an electrical connector.

JP '679, JP '779, JP '430, JP '932, and JP '684 disclose extremely broad Ni:P ranges (see below). None of these references suggest that the alloys may be improved by limiting the Ni:P ratio to between 3.5:1 and 7.5:1. In fact, identification of such a broad range implies that nearly any Ni:P ratio is acceptable ant that adjusting the Ni:P ratio does not greatly affect the alloys' characteristics. Accordingly, because a skilled artisan would not be motivated to identify such a narrow optimum range, these references fall under the <u>Antonie</u> exception.

Reference	**Ni:P Range**	
	Low	**High**
JP '679	0.025:1	200:1
JP '779	0.2:1	3,000:1
JP '430	0.002:1	5,000:1
JP '932	0.0025:1	400:1
JP '684	0.5:1	3,000:1

JP '679 discloses a copper base alloy containing 5-30% zinc, 0.5-2.5% tin, 0.005-0.4% phosphorous and the balance is copper. In reference table 1, alloys 2 and 3 further contain nickel. At column 1, lines 6-7, it appears that JP '679 discloses a range of 0.01 to 1.0 nickel, resulting in a Ni:P ratio of between 0.025:1 and 200:1. Accordingly, it is inappropriate to expect that a skilled artisan would experiment with such a broad range of Ni:P ratio to result in the Appellants' claimed range.

Similarly, JP '779 discloses a composite material having a copper alloy substrate that contains between 0.1 and 15% nickel, 0.1 and 10% tin and 0.005 and 0.5% phosphorous. From column 1 of page 2, it appears that numerous other elements may be present in amounts of between 0.01 and 40%. Among the voluminous list of other elements is zinc. The broadly disclosed Ni:P ratio ranges between 0.2:1 and 3,000:1. Accordingly, it is inappropriate to expect that a skilled artisan would experiment with such a broad Ni:P ratio to result in the Appellants' claimed range.

JP '430 discloses a beryllium copper alloy that may contain one or more additional elements. Among the extensive list of elements that can be added are nickel, zinc, tin and phosphorous. As these are optional elements, there is no recognition of maintaining a Ni:P ratio. However, within the ranges disclosed for these additions is a Ni:P ratio range of between 0.002:1 and 5,000:1. Accordingly, it is inappropriate to expect that a skilled artisan would experiment with such a broad Ni:P ratio to result in the Appellants' claimed range.

JP '932 discloses a copper alloy containing zinc and magnesium and may further contain one or more of additional elements. Among the specified additional elements are tin, phosphorous and nickel. In addition, zinc may be present in an amount of 0.01-15%. Within the ranges promulgated for nickel and phosphorous, the reference discloses ratios of between 0.0025:1 and 400:1. Accordingly, it is inappropriate to expect that a skilled artisan would experiment with such a broad Ni:P ratio to result in the Appellants' claimed range.

JP '684 discloses a copper alloy useful as an electrical connector that contains zinc, nickel, silicon, tin, iron, phosphorous and either magnesium or calcium. From the abstract of the disclosure, the Ni:P ratio may range between 0.5:1 and 3,000:1. Accordingly, it is inappropriate to expect that a skilled artisan would experiment with such a broad Ni:P ratio to result in the Appellants' claimed range.

Lastly, JP '292 suggests that the claimed Ni:P ratio is not critical. JP '292 is drawn to a brass alloy having utility as a component for a heat exchanger having a composition, by weight, of 8-20% zinc, 0.3-1.5% nickel, 0.3-1.2% tin, 0.005%-0.20% phosphorous with the balance being copper. JP '292 specifically discloses alloys 13 and

14, having a composition of 17.55% zinc, 0.27% nickel, 0.20% tin, 0.05% phosporous and the balance copper (Ni:P ratio equal to 5.4:1) and 15.8% zinc, 0.37% nickel, 0.40% tin, and 0.05% phosphorous, and the balance copper (Ni:P ratio equal to 7.4), respectively. Paragraphs [0039] and [0040] (reproduced above) disclose that both of these alloys, having a Ni:P ratio equal to 5.4:1 and 7.4:1, have inferior strength and stress related corrosion and cracking resistance. Further, such inferiority appears to be attributed to the Ni and Sn content rather than the Ni and P content. Accordingly, a skilled artisan would not be compelled to further experiment with the disclose Ni:P ratios to result in the Appellants' alloys. Accordingly, the JP '292 reference falls under the Antonie exception.

D. Appellants' claims are patentable over JP 7-126779 and JP 4-231430.

In his Answer, the Examiner asserts that JP '779 and JP '430 claim alloys that are useful in multipin connectors and sockets and electroconductive material.

While these patents disclose alloys having adequate conductivity, are not believed to provide the resistance to stress relaxation provided by the Appellants' alloys. Moreover, these references do not suggest that a Ni:P ratio of between 3.5:1 and 7.5:1 results in an improved alloy. As discussed above, JP '779 discloses a composite material having a copper alloy substrate that contains between 0.1 and 15% nickel, 0.1 and 10% tin and 0.005 and 0.5% phosphorous, resulting in a broad Ni:P ratio ranges between 0.2:1 and 3,000:1. JP '430 discloses a beryllium copper alloy that may contain one or more additional elements including nickel, zinc, tin and phosphorous. The resulting alloys have a Ni:P ratio range of between 0.002:1 and 5,000:1. It is inappropriate to expect that a skilled artisan would experiment with such a broad Ni:P ratios to result in the Appellants' claimed range.

Accordingly, the Appellants' alloys are inventive over these references.

E. Appellants' claims are patentable over JP 7-126779, JP 4-231430, and JP 6-179932.

In his Answer, the Examiner asserts that JP '779, JP '430 and JP '932 disclose option elements and that the Appellants' use of the transitional phrase "consisting essentially of" "does not exclude any of those elements since the [A]ppellants have not shown those elements would materially change the characteristics of [A]ppellant's [sic] composition."

As discussed above, JP '779 discloses a composite material having a copper alloy substrate that contains between 0.1 and 15% nickel, 0.1 and 10% tin and 0.005 and 0.5%

phosphorous, resulting in a broadly disclosed Ni:P ratio range between 0.2:1 and 3,000:1. Likewise, JP '430 discloses a beryllium copper alloy that may contain one or more additional elements and provides for a Ni:P ratio of between 0.002:1 and 5,000:1. Finally, JP '932 discloses a copper alloy containing zinc and magnesium and may further contain one or more of additional elements. The resulting alloys have a Ni:P ratio of between 0.0025:1 and 400:1.

All three references disclose extremely broad Ni:P ratios and it is inappropriate to expect that a skilled artisan would experiment with such a broad Ni:P ratio to result in the Appellants' claimed range. For this reason, the Appellants' claimed alloys are patentable over these references. The further disclosure that other elements may result in improved alloys only serves to lead a skilled artisan away from experimentation of the Ni:P ratio and supports the Appellants' contention that these references fall under the Antonie exception.

3. Payment of Requisite Fees

While Appellants do not believe that any payments are due at this time, please apply any credits or charge any deficiencies to our Deposit Account No. 23-1665.

4. Conclusion

It is respectfully solicited that the Honorable Board of Patent Appeals and Interferences consider the foregoing remakes and reverse the Examiner's rejection and allow the pending claims to issue. If the Honorable Board has any questions, it is invited to contact Appellants' attorney at the telephone number listed below.

Respectfully submitted,
John F. Breedis, et al.

Date: August 28, 2001

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